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PROCEEDINGS
OF THE
AMERICAN SOCIETY OF MICROSCOPISTS.

MINUTES OF THE THIRTEENTH ANNUAL MEETING,
Held at Detroit, Michigan, August 12th, 13th, 14th, and 15th, 1890.[*]

TUESDAY, *August 12th, 1890.*

The Society was called to order by the President, Dr. Geo. E. Fell, in the High School building, promptly at 10 A. M. Thirty-nine persons were present at this time. Prayer was offered by the Rev. Dr. Moffett, of Washington, Pa., after which Hon. Stephen A. Griggs, acting mayor of Detroit, warmly welcomed the Society to the city. To this President Fell responded as follows:

He spoke of the meeting of the Society in Detroit some ten years ago and the pleasure which he, with others, had experienced at the hands of the hospitable people of Detroit at that time. After speaking of the evidences of progress Detroit had made in the last decade, he referred to the American Society of Microscopists as an organization not to be valued by the number of its members, but rather by the character of the work in which the Society was engaged. It was the representative body of Microscopists of America as the Royal Microscopical Society of England might be said to be of Europe. When it was considered that in a city like Buffalo, of some three hundred thousand inhabitants, there was not more than a dozen active workers with the microscope, it could not be expected that great numbers would be in attendance upon the meetings of the American Society. The long distances of America constitute quite a barrier to a large attendance. The

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[*] The report of discussion herewith included is made up by the Secretary from his long-hand notes and, though sometimes given in the form of the first person, must not be understood as the exact wording of the speakers. The latter have had no chance to revise them. They are, however, as correctly reported as it is possible to do in this way.—T. J. BURRILL.

Society now numbers about four hundred members, and about one-quarter of that number are usually present at the meetings. As will be evident upon examining the program of this meeting, there will be no time to waste. If every moment is utilized, all the work cannot be fully considered. In the proceedings which will present the papers in full, all the members will reap the advantages of the existence of the organization, which is now on a secure footing, in good financial condition, and with a constituency interested in the progress of the organization as an establishsd necessary addition to the permanent scientific organizations of America. It has done good work, is doing good work, and its future promises well indeed if one-half of the workers with the microscope in our vast territory will only support and interest themselves in the organization.

Hon. L. L. Barbour, chairman of the local committee, made announcements as to excursion and entertainment, and in a witty manner promised on the part of the local committee to do anything and to furnish anything members desired if they would let their wants be known.

On recommendation of the Executive Committee the following-named candidates for membership were then elected:

H. D. Geddings, Key West, Florida; Albert T. Lytle, Buffalo, N. Y.; A. Wilson Dods, Fredonia, N. Y.; Walter Storrs Bigelow, Buffalo, N. Y.; H. B. Murray, Tonawanda, N. Y.; Chas. C. Faris, St. Louis, Mo.; Frederick C. Leber, M. D., Louisville, Ky.; Lawrence A. Harding, Fergus Falls, Minn.; Henry H. Doubleday, Washington, D. C.; Arthur F. Bartges, Akron, Ohio; John Ashburton Cutter, M. D., New York city; Augustus C. Gruhlke, Waterloo, Ind.; Mason B. Thomas, Ithaca, N. Y.; Willard W. Rowlee, Ithaca, N. Y.; Wm. J. Gillette, M. D., Toledo, Ohio; Thomas Kennedy, New Brighton, Penn.; Pierre A. Fish, Ithaca, N. Y.; Grant S. Hopkins, Ithaca, N. Y.; Thomas B. Spence, Ithaca, N. Y.; Frank A. Rogers, M. D., Brewster, Mass.; J. P. Pfanner, Buffalo, N. Y.; F. J. Schaufelberger, M. D., Hastings, Neb.; Wm. H. Sylvester, Natick, Mass.; Geo. H. McCausey, Janesville, Wis.; Louis C. A. Last, Moberly, Mo.; Robert Reyburn, M. D., Howard University, Washington, D. C.; Thomas H. Urquhart, M. D., Hastings, Neb.; James W. Hartigan, A. M., M. D., Morgantown, W. Va.; Walter N. Sherman, M. D., Merced, Cal.; James A. Close, M. D., Summerfield, Ill.; Jose M. Yznaga, Washington, D. C.; Wm. R. Chittick, M. D., Detroit, Mich.; Frank Davis, Belleville, Ill.; Henry M. Whelpley, St. Louis, Mo.; Geo. W. Rice, Detroit, Mich.; Charles Willich, Jr., New York city; Lyman L. Deck, M. D., Salamanca, N. Y.; Edmund W. Weis, M. D., Ottawa, Illinois.

The Secretary announced the deaths of Dr. F. S. Newcomer, of Indianapolis, and of Engene Pinckney, Dixon, Illinois, and obituary notices were referred to the Committee on Publication.

Lyman Deck, M. D., read a paper upon the Resolution of Amphipleura by central light, in which he stated that he had clearly seen the transverse lines on balsam-mounted frustules by lamplight with mirror and condenser perfectly centrally fixed. This was accomplished with a $\frac{1}{12}$-inch homogeneous immerson objective by Gundlach.

Gov. J. D. Cox said he hoped that before the paper shall appear in the Proceedings Dr. Deck will add to it the measurement of the actual number of striæ in the specimens of Amphipleura used. This shell varies so much in this respect that statements of resolution of Amphipleura are of small value unless the striæ of the particular shell are counted.

The recent discussion of the subject by Dr. Van Heurck in Royal M. S. Journal also shows the importance of photographic evidence of what is seen, and the tendency in the scientific world is to be quite sceptical unless such evidence is furnished. It would, therefore, add very greatly to the value of the paper if Dr. Deck could give us this demonstrative proof.

Edward Bausch: Has Dr. Deck evidence that his illumination was truly central? We may remember the discussion some years ago between Dr. Moore, Dr. Detmers and others upon a resolution of Amphipleura with mirror in central position, but by looking down the tube the illumination was found to be decidedly oblique. The statement shows such a remarkable performance that I am inclined to believe it can be explained in this way, but this can be easily decided by looking down the tube.

Dr. John A. Miller: The Doctor did not state what eye-piece he used. This makes a great difference. With a solid $\frac{1}{4}$th-inch ocular *Amphipleura* in high medium mounting can be resolved with a Bausch & Lomb professional $\frac{1}{4}$th-inch objective.

Dr. Deck: I think the light used should be considered axial, though I did not look down the tube to test it in that way. In my work at home the light was admitted through a small aperture in the window shutter and received upon the center of the concave mirror, then passed through a diaphragm $\frac{1}{8}$th inch in diameter.

Edward Bausch: A slight swing of the mirror in such cases gives oblique illumination, and a yellow spectrum is obtained.

Dr. Deck: The mirror was very carefully placed and in every way obliquity of illumination was guarded against. The light was pure white. (See note, page 170.)

A paper upon the Microscope and Camera in the detection of forgery, was then read by Dr. Marshall D. Ewell, of Chicago.

In the discussion following, Henry L. Tolman said the laws now permit comparisons of different signatures. Each person has his own idiosyncracies. You observe it in his walk, in his talk, etc., as well as in his handwriting. There is variation in it all, but the variation is for each individual within certain recognizable limits. Hence it is essential to have as many elements in a comparison as possible. The defendant himself may be compelled to furnish numerous copies of his signature, or in other ways as many as practicable must be obtained, when an attentive study will bring out the peculiarities common to all. In the recent very celebrated forgery case in Minneapolis the defendant, while upon the witness stand was compelled to acknowledge 240 papers in his handwriting, and though at length the jury disagreed the case was practically won by the prosecution. In another case a suit for libel was brought, based upon anonymous letters, and in the course of the trial it was shown by comparison with papers which the defendant was compelled to recognize as his own that the anonymous letters were his also, and the case was so decided. Now in the case presented to us by the author of the paper there was certainly a very clever imitation of the signature. There is, however, a waver in the down strokes, and this is an excellent way of detecting the forgery if it can be shown that they do not occur in the original. Simple similarity of handwriting does not mean much, because all copy another at some time; but when the similarities include the peculiar, individual characteristics, then some direct relationship must be suspected. In this case the man's imitation of the lady's hand had been well done, but could be detected in the manner mentioned.

The next paper, by Grant S. Hopkins, of Ithaca, N. Y., upon the Structure of the stomach of Amia Calva, was read by the author.

Professor Gage stated that the work had been undertaken at his suggestion because Americans should especially apply themselves to the forms of life peculiar to this continent and not thrash over the old straw of European laboratories. In this case the author of the paper had spent a long time upon his subject, doing his work with much care, and the result was a contribution to knowledge in the line of American histology worth working for.

The President: What supposed function has this ciliated epithelium in the stomach of this animal?

Mr. Hopkins: That has not been determined.

Willard W. Rowlee then read a paper upon Imbedding and Sectioning mature seeds by the paraffin method.

Mr. Tolman observed that the method described was no doubt the only way to get good sections of whole seeds, but one could hardly be sure that the process had not changed the true appearance of the structures. He had found the best way was to select the material at just the right stage of growth or maturity, when there is a sufficient amount of mucilaginous substance to hold the parts together. He would then cut without previous manipulation.

Professor Gage: A considerable part of the work described was done in my laboratory, and so I had a chance to know about its results. Have been cautious about the use of paraffin with animal tissues and can appreciate the danger of change in tissues during the methods of preparation, but can say that there was no considerable amount of deterioration in the present case. Moreover, it is the only way to obtain serial sections and these are a necessity in numerous instances. Points can be made by their use which are impossible otherwise. To study whole seeds nothing but serial sections will suffice.

Mr. Rowlee: If it is true that good sections of such material can be made without imbedding, nothing further can be desirable, but I have thoroughly tried and failed; cannot get along without some method of imbedding.

The Secretary expressed his gratification in the presentation of the paper and his conviction of the importance of the process described to botanists.

Adjourned.

T. J. BURRILL, *Secretary*.

AFTERNOON SESSION.

When the President called the Society to order at 2 p. m. there were 36 persons present. This number was increased to about 60 during the afternoon.

The first item of business was a discussion opened by Professor Ewell, of Chicago, upon a proposed standing committee of the

Society on medico-legal microscopy. The following is a rather meager abstract of the discussion—all the Secretary was able at the time to report:

Dr. Ewell: In matters pertaining to the public welfare two things are most important, viz., the preservation of health and the preservation of life, and the microscope has much to do with both. I cannot but appreciate the high degree of excellence of the modern compound microscope, yet it is not a perfect instrument. Its powers are definitely limited and a strong protest must be made against the too prevalent practice of claiming too much for it. A recent communication in a prominent microscopical journal claimed facts in regard to the Cronin murder which should not be tolerated in respectable print. The statement was made that not only had blood found been identified as human blood, but that it was from the body of Dr. Cronin! A committee should be appointed to help prevent the dissemination of such monstrous untruths, even if editors do hide behind the common assertion that they are not responsible for the statements of authors. There should be some way of establishing a general standard by which all such matters could be measured and the ridiculously false separated from the true. This proposed committee should make such a standard.

Dr. F. L. James agreed with the last speaker in the evil resulting from praising the microscope beyond its capacity of performance. The bombastic claims made for the instrument did more harm to real progress in the direction in which this Society is especially interested than anything else. Such articles as that cited are sent to all journals. An editor is responsible for printing such things. In his own journal the statement was not printed in regard to the editor not being responsible for the views of correspondents. An article had recently come to him in which the writer claimed to have proved that a certain skin disease was due to the spicules of sponges, because he had cultivated the spicules and made successful inoculations therewith. To publish this would give indorsement to the absurd idea. So in regard to the papers presented to this Society. They should all pass through the hands of a competent committee before the titles were placed on the program.

Dr. W. H. Seaman: Would also second the movement for the committee suggested. It is one of the ways by which this Society can make its influence felt. We should agree upon a standand by which all general statements can be tried. In this way the efficiency of expert testimony can be augmented. The association of agricultural chemists have established a standard which is accepted in the courts, and there is no reason why this Society may not do the same for its own department of knowledge.

H. L. Tolman: It is doubtful if any action we might take would be considered worth anything in the legal sense. In a court everything must be presented by sworn witnesses or by other persons under oath. The thing, however, that can be done is to raise the public standard of information and so make all capable of discerning what is notoriously false from what may be accepted as possibly true.

Dr. Seaman : A committee could formulate matters so that others besides specialists could tell what might be expected and what could not be looked for as results of microscopical work. Let the facts be stated as to the identification of human blood and let this receive the sanction of this Society; it would certainly help before a jury to settle important cases.

Dr. J. O. Stillson : Courts of justice expect us to state confidently whether or not a specimen is human blood, human hair, &c. Now, there is enough that can be decided by a proper use of the microscope, but it is altogether bad to claim more. It should be understood in some way what ought to be expected and the testimony confined within proper limits. A committee ought to help do this.

Dr. Ewell : I have no faith in being able to produce much of an impression upon public sentiment. If we can improve the ideas and expressions of scientific men, we shall be doing well. In such matters every one should invite criticism from every seeker after truth. We must be scientific agnostics—believe nothing and know nothing except that capable of positive demonstration and not until proved beyond cavil. Criticism then can do no harm, and before this may do good.

Professor Claypole: Such a committee may provide a standard by which not only men of science may be guided, but by which lawyers and judges may inform themselves and govern their actions accordingly. A good help of this kind would tend to dispose of the farce too frequently presented when an astute lawyer pits the testimony of one expert against that of another.

Dr. Stillson: The work of the committee will serve as a check upon ourselves. We are very apt to be enthusiasts, and as such carried beyond proper footing. We pose in the newspapers and otherwise as authorities without having had sufficient study and experience in the special line of facts in hand. We want something to show that when it is claimed that by a microscopical examination of blood two persons are pronounced fit for marriage, or that an individual is fit for some certain occupation, that any one may know the claim is a humbug. The best workers in their own fields ought to be appealed to to set a standard of what can and what cannot be expected, and then this ought to be relied on as truth or the nearest possible approach to it. There is work for such a committee.

The President: Of how many persons shall the committee consist?

After some discussion on this point the following were appointed: M. D. Ewell, W. H. Seaman, H. L. Tolman, J. O. Stillson, and E. W. Claypole.

A paper upon the Application of Microscopy to Pharmacy, by Dr. H. M. Whelpley, of St. Louis, was read by title, in the absence of the author, and referred to the Committee on Publication.

The next paper, upon Microscope Objectives, was read by the author, T. J. Burrill.

Dr. J. A. Miller: If it is a fact, as has been asserted elsewhere, that the front lens of Zeiss apochromatic objectives is made of fluorspar instead of glass, the durability of the objectives must be seriously questioned, for this mineral is not reliable compared with well-known kinds of glass.

Professor Gage: Have used the apochromatics ever since their introduction with the very best satisfaction. Thought an 8 mm. objective had deteriorated. Looked as though there were ashes on the back lens—not dust, but ashes. Showed it to Dr. Ewell, and he thought it must be due to the corrosion of the lens.

H. L. Tolman: The paper detailed results obtained in a careful way and as such was a model presentation, but there is perhaps the liability of a misunderstanding in regard to the value of wide angles. Abbé's researches go to show that future advance is likely to be made with central light and with wide enough aperture to pick up the rays necessary for the best pictures. We have learned that in these matters we must be guided by theory as well as by experience and practice. In case of difference in results we must trust the wide angles in preference to the lower ones. In regard to Gundlach's objectives, it is nothing new, neither is it any disparagement to say, that they vary much in quality. The best are superb, almost or quite beyond competition, but others of the same nominal grade are much less valuable.

Dr. Ewell: My work has, to be sure, been principally upon ruled lines, but I have long since found that I wanted just as wide-angled objectives as I could pay for. The wider the aperture the better the results; have been abundantly satisfied with those of the Bausch & Lomb Optical Co. In the study of blood I have preferably used a $\frac{1}{10}$th homogeneous immersion of Spencer, using an amplifier when necessary with it. This has seemed to me equal to Zeiss' apochromatic, except upon *Amphipleura* with central light.

Professor Gage: The author of the paper states that he chooses for students' use a $\frac{1}{2}$-inch and a $\frac{1}{5}$th-inch objective. I prefer at least a $\frac{1}{8}$th inch. The $\frac{1}{5}$th inch does not give sufficient magnification. Students often fail to recognize the objects seen under such a power from the figures in the books, when they would do so readily with greater magnification.

Professor Kellicott: Can Professor Gage suggest an $\frac{1}{8}$th that he would recommend in place of the $\frac{1}{5}$th?

Professor Gage: Any good, dry, non-adjustable objective of that power will do.

Governor Cox: We are in danger here of putting the matter under discussion upon an incorrect footing. Instead of speaking of the focal length, the angle of aperture should be substituted. I have for some time been in the habit of selecting indifferently the objective I wish to use upon a given object by the angle and of making up the mere magnification necessary by the eye-piece. I now have in my possession a $\frac{1}{4}$th inch that will do anything that any $\frac{1}{10}$th inch of the same angle will do. The difficulty, however, comes in the manufacture of the wider angles of low power. The opticians can furnish us better goods for the money when the focal length corresponds in some degree with the angle of aperture.

Professor Gage: I can certainly agree with what Governor Cox has just said. It is, however, necessary in most cases to pay special heed to the item of cost, and, taking this into account, I have found an $\frac{1}{8}$th-inch dry objective of good angle the most satisfactory and economical.

The next paper, Additional notes on Gomphogaster, by C. M. Vorce, was read by title and referred to the Committee on Publication.

Professor Gage then read a paper prepared by Dr. Wm. C. Krauss, of Buffalo, N. Y., on Some methods of treating Nerve Tissue.

Dr. Ewell proceeded with a review of some of the medico-legal questions involved in the Cronin case.

Mr. H. L. Tolman, of Chicago, said that in discussing the subject he should try to avoid entirely the personal element and confine himself strictly to facts. It was greatly to be regretted that so many and so gross mistakes were made in the newspaper reports, and, worse still, in the stenographer's original record. No opportunity could be had to correct the stenographer's notes, and he was made to say things very different from the real testimony. This latter he still adhered to and wished it might be exactly known ; should not fear criticism.

It was very unfortunate that the experts called in the case had so little time after the material was presented to them before they were called on to give their testimony in the court. The public excitement was so high that many things were managed differently from what would have been the case under other circumstances. Dr. Belfield and himself were engaged by the prosecution. They had been furnished with a chip of wood, taken from the floor of the Carlston cottage, on which were two drops of blood, and with some blood-stained cotton. To hasten the examination these materials were divided, Dr. B. taking the cotton and himself the bloody chip. From this last only 56 perfectly round normal blood corpuscles could be obtained. Had very carefully removed the blood to get it all. Would have been glad to have much more of it, but basing his information upon these and on the presence in the clot of several specimens of lanugo, he testified that the strong presumption was that it was human blood. The blood corpuscles averaged 1–3310 of an inch, considerably above the average. Did not say positively the blood was that of a human being. In dissolving the stain he had used a salt solution of 1.055 specific gravity, the specific gravity of the whole blood instead of that of the serum, because he was anxious that the error, if any, should be upon the right side, on the side of human life, with which his testimony must be weighed. The blood corpuscles are subject to the rigorous laws of osmosis, and as the normal serum has a specific gravity of 1.028 the salt solution used could not make the corpuscles too large. As to the exclusion of certain elements, this too was done with full knowledge of the requirements to obtain accurate results. No one knows what the so-called blood-plates are, either in their origin or destiny.

Everything which did not fall within the wide limits of 1–5000 to 1–3000 of an inch was excluded because they could not be known to be blood.

Now in regard to lanugo. According to the theory of evolution and descent now so commonly accepted, the hair remnants on the human body are degraded in size and structure from original, fully developed hairs. Such degraded elements have certain characteristics different from normal forms. They must be studied as degraded forms if we would arrive at truth, not compared with normal structures. It is so with parasitic plants and with parasitic animals, both of which are mostly much reduced in structure from that of the types. He had, therefore, taken every possible opportunity to collect lanugo; had secured large numbers of samples from patients at the Cook County hospital, and had collected from every animal in Barnum's menagerie as well as others, and after much study had failed to find any identical with that on the human body.

Now, as there are only a few grains in weight of this substance on the whole human body and as it is comparatively permanent, there cannot be much of it floating in the air or to be found hap-hazard on any other surfaces. The reported reliance placed upon epithelium scales was a mistake. Nothing decisive was claimed for the presence or condition of this in the blood-clot.

In regard to the measurement of blood, it is not hard to show what should be taken for the true periphery of the corpuscle. This is lens-like in shape and effect upon light. The dark boundary line results from a dispersion of the rays, and as this is nearly equal in both directions the center of the dark border must be the true edge of the corpuscle. Used both Rogers' ruled glass and filar micrometer with essential agreement in the measures, but prefers the former for this purpose. Had given much attention to the effects of disease on the size of the corpuscles. As a rule, in anæmic diseases the corpuscles are less and in inflammatory diseases they are larger than the normal dimensions. Embryos have larger nucleated corpuscles, but post-embryonic corpuscles soon become normal size.

E. H. Griffith: Does the habitual use of alcoholic stimulants change the size or character of the blood corpuscles, or does sudden excitement make any difference?

Mr. Tolman: There is no change in the blood corpuscles from sudden excitement, but there, no doubt, is some modification due to stimulants. It is found that there are proportionally more small corpuscles after meals than at other times.

Prof. J. A. Miller: In connection with this question of blood, it may be interesting to state that an examination of the blood, of

Kemmler showed that it had an acid reaction, but no other change from the normal condition could be detected, either microscopically or by the spectroscope.

E. H. Griffith: Mr. President, may I inquire of the gentlemen present whether any of them have any knowledge of the effect upon the blood of long-continued alcoholism?

Dr. McIntosh: I can say that the blood is considerably affected by excessive alcoholism. I once examined the blood of one of the worst cases of the kind I ever knew. Incredible as it may seem, the man actually swallowed three to four pints of strong Bourbon whiskey daily. The blood corpuscles were certainly much smaller than usual, and one-third to one-half of them were much crenated and otherwise abnormal.

Dr. Ewell: I should just like to say that the rule was entered that all expert witnesses in the Cronin case were to be examined separately. I had nothing to go by except the record as made by the stenographer and the newspaper reports. In this so-called restoration of blood it seems to me there are too many loose statements. How can blood-plates be distinguished from blood-clots? Know of no way to restore blood-plates.

The President: Dr. McIntosh will show with his projecting lantern to-morrow blood taken from Kemmler, both from the leg and from the brow, and it will be seen that there is a marked difference between the two. Due notice will be given of the time, so that all may be present.

Professor Kellicott read by title his paper on the Rotifera of Central Michigan, after which Professor Gage presented a paper upon the Transition from Columnar to Stratified Epithelium.

Adjourned to meet informally and socially at the hotel headquarters during the evening.

T. J. BURRILL, *Secretary.*

WEDNESDAY, *August 13, 1890.*

The meeting was called to order at 10 o'clock A. M. by President Fell, at which time 47 persons were present. This number subsequently increased to 60.

On recommendation of the executive committe the following-named persons were elected to membership: H. O. Walker, M. D., Detroit, Mich.; R. C. Olin, M. D., Detroit, Mich.; Stuart H. Perry, Pontiac, Mich. ; R. C. Hutton, M. D., Detroit, Mich. ; James Cleveland, Jr., M. D., Detroit, Mich. ; Oscar Edward Cartwright, Detroit, Mich. ; Clarence D. McLouth, Ypsilanti, Mich. ; John Bridge, Detroit, Mich. ; W. G. Latham, Detroit, Mich. ; H. C. Wyman, M. D., Detroit, Mich. ; A.W. Imrie, M. D., Detroit, Mich. ; W. R. McLaren, M. D., Detroit, Mich. ; J. B. Book, M. D., Detroit, Mich. ; Mary E. Van Schoonhoven, Ann Arbor, Mich.; Dr. Anson S. Traser, Sarnia, Ontario; T. L. Hazzard, M. D., Allegheny, Pa.; A. E. Hiss, Chicago, Ill.; Herbert Walker, Pittsburgh, Pa.; Charles E. Barr, Albion, Mich.

A report of the committee appointed yesterday on medico-legal matters was accepted and referred to the Executive Committee to place it upon the program at some suitable time for discussion.

After an announcement by Dr. Manton in regard to a working session and remarks by several members, it was moved and carried that a working session be arranged for, beginning at 2 P. M. Thursday, the 14th August, and that at 3.30 P. M. the same day a session for the reading of papers be held. It was then ordered by vote that we meet at 9 o'clock, local time, Thursday morning.

The first paper of the morning session was by Dr. M. D. Ewell upon "Some experiments to determine the limit of vision as related to the size of the object observed." Nineteen different persons tried to determine at what distance one square mm. of black color on a white background, or the reverse, could be just seen and at what distance it could be just defined as to form. The experiments were tried in a well-lighted room in the daytime and by persons from 17 to about 50 years of age. The average distance for the former proved to be 26 feet 4 inches for the black square, and 22 feet 11 inches for the white square, and for definition of shape in the two cases the mean results were respectively 5 feet 10 inches and 5 feet 7 inches. Reasoning now upon the visual angle subtended, the author deduced the conclusion that at a distance of ten inches a black square on a white ground must be 1–790 inch on a side, and that with an amplifying power of 1,000 diameters and a tube length of 10 inches, a similar object to be visible must be at least 1–790,000 of an inch on a side, while to be defined these dimensions must be respectively 1–175 of an inch and 1–175,000 inch. Experimenting in the same way with himself, the author found that to be seen at ten inches the size must be 1–870 inch, and to be defined 1–155 inch. Much smaller *lines* can be seen. It is quite likely that different colors would give different results.

The possibility of error on account of the difference between macroscopic and microscopic vision was alluded to, but it was thought that the errors here would be no greater than would be liable to occur in other methods of determining this limit of normal vision. It is expected that the author will, at a future time, report the results of further experiments of this kind.

In regard to the measurement of minute objects, Dr. Ewell stated that with very high powers, such as 1–25-inch objectives, the filar and Jackson micrometers were practically equal; but for moderate magnification the former is far ahead of the ruled glass.

Dr. Seaman: We are very liable to make mistakes when we use the results of experience with unaided eyesight for determinations of microscopic vision. It is well known that lines are easier to make out than dots, yet many persons whose eyesight is supposed to be normal cannot count ruled lines 1–100th of an inch apart. The American Society of Photographers have been trying to determine the conditions of a fixed focus for use with objects at all distances, and it had been determined that lines 1–250th of an inch wide could not be distinguished by an ordinary individual from those of less dimensions, and so blur to that extent would not be recognized. Training in such matters has much to do with results, but probably 1–250th inch is less than anybody would be likely to measure with his unaided eye.

Dr. Ewell: Did you say that one second of arc was visible?

Dr. Seaman: It is so stated in text books.

Dr. Ewell: So much the worse for the text book.

Governor Cox: We must keep in mind that in microscopic vision the wave length of light counts as a factor, and so we must be careful about our deductions when we reason from natural eyesight to that of microscopic vision.

Gov. J. D. Cox now opened the discussion upon representation of the Society at the World's Fair in Chicago, 1893. He said the opportunity for the assemblage of juries of competent experts in all lines of science and art, as well as in other matters, would be very great, and great inducements to attend will be offered. There will undoubtedly be a great display of instruments and apparatus, and so there will be congregated a great number of workers who as specialists make use of the various devices. There ought to be, and doubtless will be, gathered the largest body of such workers ever brought together. The question now is, how shall the representation be made and who shall manage it? This organization will be looked to for advice and help. Some one must study the problem, must acquaint themselves thoroughly with what has heretofore been done, and must recognize what is now demanded, and devise methods for procedure. Shall we have a special committee appointed for this purpose, or shall the subject be left with the officers of the Society? It so happens that the Secretary to be chosen at this meeting will hold his office until after the work of organizing and inaugurating the fair is completed, and attention to this point ought to be considered in the election. The Secretary is, presumably at least, the working man among our officers, and upon him will devolve much of the responsibility of the occasion. Again, what can our members resident in Chicago do? It might be an excellent thing if a Secretary can be selected from one of their number.

The fears expressed that the nations of the earth will be deterred by our restrictions upon trade, etc., from making a great display are, I trust, without foundation. There is no reasonable need for fear in this direction. It is a foregone conclusion that there will be a great exhibition. We are not to consider whether or not we shall aid in this, but must decide what we shall endeavor to do and then select the men to carry forward the work.

H. L. Tolman: The State microscopical society, with its headquarters at Chicago, has had the matter under consideration and asked that its delegates to this convention look after the subject here. Upon this authority he now extended to all members of the American Society the heartiest invitation to attend the fair and to take part in whatever may be agreed upon for the exhibition and meeting. The thought had been advanced of combining with photographic and other optical affairs, but it seemed to be the opinion that the microscopical exhibits and interests should be kept separate. It is proposed to have an appropriate place designated as headquarters, where all workers with the microscope will find a cordial welcome. The directors of the fair will favor anything and everything of this kind, though no doubt some of the expenses will have to be borne by those who take part. The local board cannot do more now than offer space, but it is assured that this will be furnished in any reasonable amount. It is believed that Congress will permit the exhibition of the material in the National Museum and in that of the Army and Medical Museum, including the unrivaled work of Dr. Woodward.

It is eminently proper that this Society should lead off in this great undertaking; and, if so, rest assured the Illinois State Society will fall into line and work with a will.

Dr. L. D. McIntosh: It has been proposed to induce the local board to put at the disposal of such organizations a suitably equipped hall for meetings, lectures, demonstrations, &c., in connection with a display of instruments. He felt like personally assuming the responsibility of furnishing a large amount of apparatus for such purposes and would lose no time when he returns home in endeavoring to start the ball rolling.

Dr. Seaman moved that a committee be appointed by the Chair to consider the matter and to take such action as may be deemed necessary and expedient. The following-named persons were so appointed: J. D. Cox, W. H. Seaman, L. D. McIntosh, H. L. Tolman, J. A. Miller. This committee was empowered to add others to their number if considered desirable.

Dr. A. Clifford Mercer then presented his paper on "A mooted matter in the ordinary use of an eye-piece in photo-micrography."

In the discussion following Governor Cox said that the compound microscope was an instrument composed of an objective in one end of a tube and of an eye-piece in the other end of this tube. Thus constituted, the instrument was one thing, and the removal of any of its parts destroyed the instrument in an essential and critical sense. If any part is made use of by itself you are working hap-hazard and are exceedingly liable to get poor results; had once asked Mr. Spencer about the correction of his objectives and had been informed that they were adjusted by the use of a certain eye-piece. Hence, to get the best results with that objective it should be used with the identical eye-piece with which the optician himself made his corrections, or at least with one of the same construction. In his own practice he had for a number of years used the same eye-piece in photographic work that he used for direct vision with his collar adjustments the same, and, on account of the nature of the objects photographed, the reproductions had gained wide repute and had been examined by many persons. Dr. Detmers had also done some remarkable work in the same manner, though with oblique instead of central illumination. His photographs of Amphipleura were equal to any that had been examined by the speaker. We may therefore say that at least as good results have been obtained with the use of the eye-piece as in any other way, and as to the theory of the instrument we are liable to the most surprising misapprehensions. What, indeed, do we know of the optical properties of a compound microscope? We treat the parts as though they were simple lenses, and then from them endeavor to make up our theory of the combined instrument, and no one can know that his conclusions are correct without practical demonstrations.

Now it is of course recognized by all that the adjustment of the objective must be properly made in correlation with the distance of the conjugate focus. This last may vary greatly. Dr. Woodward used the whole room as a tube for his instrument. If we are told that in changing the distance of the conjugate focus we spoil the instrument, a great deal is assumed. The disturbance is likely to be much less than it will be by inserting any other optical contrivance, such as an amplifier, not considered in the original correction of the objective. This is well shown by the extensive and critical trials of numerous pieces by Dr. Woodward, during which only one amplifier was found to work satisfactorily. Of course the focus must be readjusted for photographic work and the results obtained in the paper are just what theory and experience demands.

Secretary Burrill: I need not say to Dr. Mercer that I have been greatly interested in his account of the experiments tried and in the results obtained, because I was one of the members alluded to in the paper who had expressed my inability to explain the apparent phenomena observed by myself. The matter has been during several years a veritable puzzle to me. I would gladly accept the explanations made, because they are to my mind just what theory says they must be, yet the stubborn fact remains that by placing a screen at a given relative distance from the eye-piece I can make the sharpest possible photograph without the least adjustment of the focus from that procured by the eye. Now, we agree theoretically that the rays from a given point of an object under the microscope emerge from the eye-lens *diverging*, and that traced forward these diverging rays (converging forward) form the virtual image at a point where they apparently meet or would meet if prolonged forward from the eye; but such diverging rays can never, according to theory, again form a picture upon a screen or anything else until they are made to converge and form an image where they meet. Now this is just the impossible thing that I have done unnumbered times and can readily do over again with certainty of success. With my photo-micrographic apparatus, a home-made affair, I can remove the connection between microscope and dry-plate holder, insert my head and adjust the focus after the ordinary fashion by the eye applied at the ocular. Without moving the instrument in any way the connection with screen is readjusted and exposure made with a sharply defined picture as the result. This is the dilemma in which I find myself: Theoretically I know it cannot be done; practically I know it can be done.

Dr. Mercer: Are your eyes presbyopic?

Secretary Burrill: Yes, sir; I use convex eye-glasses.

Dr. Mercer: Do you use your glasses when adjusting the focus of your microscope?

Secretary Burrill: No, sir.

Dr. Mercer: That is the explanation of the whole thing. In your special case the rays from a point of the object emerge from the eye-piece converging and must be so to suit your eye; hence the image on the screen is correctly formed.

Secretary Burrill: I shall be delighted to find that this explanation is the true one, for it is exactly what optical science indicates and demands.

Dr. McIntosh: There can be no question as to the accuracy of Dr. Mercer's results. The focus of the objective must always be adjusted according to the distance of the screen.

The paper was further discussed by Messrs. Tolman, Barr, Cox, and Claypole—all practically agreeing with the author's explanations.

Governor Cox said that he had tried all the prominent kinds of eye-pieces and had sometimes used the screen three to four feet distant, but had never found anything better than the Huyghenian eye-piece.

In answer to Professor Claypole, Mr. Tolman said that in good objectives the actinic and visual foci were practically the same with higher powers than a ¼th inch.

Dr. Mercer could not agree with Governor Cox in holding that as the objective is always corrected with an eye-piece, never without, thus making the whole compound microscope a unit in action, therefore an eye-piece should always be used with the objective to get the best results in photomicrography. He called attention to the fact that in the ordinary use of the microscope a virtual image is seen; and, further, that the whole instrument is corrected to make that virtual image as perfect as possible for rays of light taking mathematically defined paths through the various lenses. In photomicrography with the whole instrument, not a virtual but a real image is formed by rays taking not the same but very different paths through both the objective and eye-piece. Now, for example, the rays incident on the eye-lens come from an aerial object beyond its principal focus, while in the first instance rays are from an aerial object within the principal focus of that lens. The eye-lens is not achromatic, but in the first instance its aberrations are corrected by its relative position. In the second instance the radical change in the paths of the rays allows both chromatic and spherical aberrations to vitiate still farther the already faulty image formed by the objective working at the disadvantage of a change in position (at a greater distance from the object than that for which it is so nicely corrected). It is an error (*The Microscope*, Naegeli and Schwendener, London, 1887, p. 161) to suppose the Huyghenian eye-piece compensates for residual aberrations of the objective. The corrections of the objective are complete in themselves and are especially such as enable the objective to project a real image at a certain distance. This, then, is the best image to which the photomicrographer can expose his sensitive plate. If this image is too small it can be enlarged by projecting it to a greater distance by the use of a specially corrected negative lens, as was practiced by that best of workers in photomicrography, Dr. Woodward, or an enlarged image of the image can be projected by specially corrected lenses after the Abbe method. A Huyghenian eye-piece is not corrected for this, but for a radically different purpose, and is, therefore, at least theoretically, quite out of place as a projecting lens.

The next paper, by Dr. R. N. Reynolds, on Making gelatine and injecting small animals, was read by himself.

Following this came a paper by Professor Gage on "Picric and chromic acid for the rapid penetration of tissues for classes in histology." At the conclusion the author said that the main value claimed for the method described was that students might thus prepare their own material, which he believes to be a matter of importance, and asked for the views of other instructors.

Messrs. James, Tolman, Claypole, and Mercer replied, all heartily in accord with the speaker.

Professor Claypole said that sometimes students were at first inclined to rebel, thought they were not learning anything, but after a time gained much greater enthusiasm and inclination to go on than by the cramming process, by which they, perhaps, obtained more facts, with much less likelihood of making use of their work in after life.

Dr. Mercer thought it a good plan to get students to buy microscopes and work with their own instruments, taking more interest in consequence and being much more likely to continue their studies beyond the time of school attendance.

In the absence of Dr. Lucien Howe, whose paper on "The action of bacteria on the conjunctiva of the rabbit" was announced upon the program, Dr. F. L. James called attention to the proper distribution of the printed proceedings. He said the Society was not known according to its merits. He had written several well-known journals requesting the publication of the announcements of the meeting, etc., and had word returned that the Society had never been heard of. Others had willingly inserted such matter. He moved that the proper officer be authorized to distribute from 100 to 200 copies of the proceedings where they will do the most good in advertising the Society. The books are too valuable to be buried.

President Fell: This is a very important matter. The Society ought to be much better known than it is. When making arrangements for the meeting here in Detroit persons approached knew nothing of the association or of its work. The medical journals were favorable to the work of the Society when they knew what was done, and some of them had published his first circular in full.

Mr. Tolman seconded the motion and hoped that the printed proceedings would be widely distributed.

Governor Cox said there was danger of not knowing just what we are doing. Many new members will want sets of the proceedings, and it is probable that the earlier numbers will be hard to furnish. We all know how this is with many European societies, whose earlier transactions are now scarce and esteemed of high value.

Professor Gage wished to emphasize this last statement. He would hold carefully the back volumes, but would liberally send out current numbers. The publications are worthy ones and would do us honor in the great libraries of the country, yet very few of them have copies. These should be sent to all of the great journals interested in the subjects here presented, and they would help to put the Society in the position it should occupy in public knowledge and esteem.

Mr. Mellor made a statement concerning the amount of receipts from the sale of copies of the proceedings, after which Dr. Mercer moved to refer the matter to the Committe on Publication, to report at the next meeting, but to have power to act for the coming year. He also suggested that it would be well for the same committee to take into consideration a place of deposit for the duplicate volumes. His motion prevailed.

Professor Kellicott remarked that the Secretary has a list which had been approved by a former executive committee, and that this list should have been amended as necessary and the copies promptly sent out.

Adjourned.

T. J. BURRILL, *Secretary.*

AFTERNOON SESSION, *August 13, 1890.*

Society called to order by President Fell at 2 o'clock.

On recommendation of the Executive Committee, J. E. Baker, M. D., Wyoming, Ohio, and Edwin A. Strong, Ypsilanti, Mich., were elected members.

The first subject presented was by Professor Gage on Uniformity of tube length, after which Edward Bausch read a paper on "The full utilization of the capacity of the microscope, and means of obtaining the same."

The discussion which followed covered both subjects.

Governor Cox: There is a method of determining the length of the conjugate focus not directly referred to by Professor Gage, which is worth keeping in mind in this discussion. Reference is made to the so-called Cross formula with Dr. Woodward's modification of it. The first was originally published in Silliman's Journal. As a basis for this formula the distance from the object itself to the image as formed in the Huyghenian eye-piece is measured. This image, as is well known, is situated in the diaphragm of the eye-piece. This measurement does away with the trouble arising from the variable length of the brass setting of the objective and with the position of the ocular in the tube. It also gives us a scientific value not vitiated by any mechanical variations.

There is another thing that has been generally overlooked and is of unrecognized importance, viz., the difference in amplifying power by the objective with the adjustment collar in different positions. In some cases the difference amounts to nearly one-half the total amplifying power, an objective magnifying 500 diameters when open giving 750 when closed. He had made a table giving the magnification for each number on the adjustment collar and found it of considerable service in various ways.

Mr. Tolman: There is still another point from which tube length may be counted, viz., the posterior conjugate focus for parallel rays. This lies commonly from one-half to three-fourths of an inch outside of the objective, but in higher powers considerably further forward. The determination of this point is not so simple a matter as measuring the brass-work, but it may be worth the while to take more trouble to secure better results. As to the upper point, it is no doubt best to take the upper end of the draw tube and then make all oculars so that the image will correspond with this. There would be trouble sometimes in securing the last, as with binoculars, but nothing better can probably be suggested.

Governor Cox asked Mr. Bausch whether there is any reason for adopting any certain length for the tube as opposed to any other length.

Mr. Bausch: No; there is not. It is only necessary that some standard length be made, and then objectives can be corrected accordingly. Would be glad to follow the suggestions of this Society in this regard. He also afterwards stated that there did not seem to be any optical preference for the ten-inch tube over that in common use on the continent, unless the longer tube gave better facilities for correcting spherical aberration.

After further discussion by Messrs. Tolman, Mercer, Gage, Close, Ewell, and Burrill, on motion of Dr. Mercer a committee, consisting of S. H. Gage, Edward Bausch, and A. C. Mercer, was appointed to report, before the close of the meeting, recommendations for adoption by the Society upon the upper and lower points between which tube length shall be measured.

Professor Gage then exhibited for inspection and criticism some diagrams of the microscope designed for aid in instruction, and also a modification of Abbé's camera lucida. The latter improvement consisted in a graduated arc by which the proper angle of the reflector can be readily adjusted. He commended this camera as the best in use and said that anybody could use it with much satisfaction after a very little practice. Several points brought out very clearly by showing the instrument itself cannot be readily reported here. It was, however, generally agreed that the camera was an exceedingly valuable aid in drawing, surpassing for this purpose any other known.

A paper upon the Ammoniacal fermentation of Urine, by Dr. V. A. Moore, was read by Dr. Seaman.

The next paper, by Pierre A. Fish, on the Epithelium of Brain cavities, was read by Professor Gage, after which a paper was presented by Professor and Mrs. Claypole, called Notes on *Baryeidamia parasitica, Karst.*, found on stored onions. The last was really a description of a parasitic mould upon other moulds found on onions and elsewhere. The life history of the parasite was given as far as traced, and slides illustrating it were afterwards shown. It is believed to be the first mention made of the curious fungus in this country. The work had been principally done by Mrs. Claypole.

Professor Claypole then presented a resolution providing for associate memberships in the Society, which was referred to the Executive Committee for recommendation.

Adjourned.

T. J. BURRILL, *Secretary.*

EVENING SESSION, *August 13th, 1890.*

The Society convened, in its room at the High School building, at 8 o'clock, to listen to the President's annual address. At the appointed hour, a good audience being present, President Fell called Vice-President Seaman to the chair and proceeded with his address upon the Influence of Electricity on Protoplasm.

At the conclusion of the address the Society adjourned.

T. J. BURRILL, *Secretary.*

THURSDAY, *August 14th, 1890.*

The first thing of the forenoon session was a report on micrometry by Professor M. D. Ewell, who consented at the time to open the discussion in place of Professor Rogers, not present.

Dr. Ewell explained, by an illustrative example, the method of determining the error, if any, in micrometric ruling when the correction of the total length of the scale (as of a centimeter) is known.

This explanation the President thought worthy of permanent record and asked the Doctor to furnish the manuscript for the purpose. Finding it impossible to comply in time for this publication, Dr. Ewell promises a paper upon the subject for next year.

Professor Miller: Do you accept the scale of the filar micrometer as the maker furnishes it, or do you determine its value?

Dr. Ewell: I have a filar micrometer by Zentmeyer and one by Bullock and both are works of art; have tested them with great care and find that the error in each case is less than the personal error in making the comparisons.

In answer to questions by Messrs. Seaman and Tolman the Doctor replied that a large number of observations should be made and the results averaged, and that all the spaces should be included unless there is reason to suppose some one or ones of them are incorrect. In measuring, his practice is to read from the left side of one to the left side of the next, counting in each case the edge in same way, sometimes leaving a line of light, sometimes just shutting this off; often puts finger on side of tube and pushes just enough to try the correctness of the position. If the milled head should be turned too fast turn a little way back and carefully approach position again, always turning so as to come up to the line in same way; uses a cobweb, not a wire. It is specially important that the head of the micrometer should turn very easily and smoothly.

The next subject upon the program for discussion was the advisability of adding more members to the Publication Committee, opened by Professor Kellicott.

He said that as the committee was now constituted the President-elect was made a member of this committee, though he had taken no official part in the proceedings of the meeting and could not be specially acquainted with the matter presented for publication. On the other hand, the retiring President, not now a member of the committee, had during the preparations for and the progress of the meeting every facility for gaining information concerning these matters. It therefore seemed wise to so change our law that the President of the Society should be a member of the Committee on Publication during the time when the proceedings of the meeting over which he presided were under consideration. He would further suggest that the two Vice-Presidents be added to the committee. The duties of these officers in the usual run of things were simply to audit the accounts of the Treasurer. This would give them something more to do and introduce them somewhat to the affairs of the Society, as well as secure their aid in the discharge of important business. The proper selection for publication and judicious management of this latter work must always be exceedingly important to the best interests of the Society, and the addition of these officers to the committee would be a help in that direction.

Governor Cox: In practice how do you succeed in getting effective consultation by members of the committee and thus relieve the Secretary of taking the responsibility upon himself?

Professor Kellicott: That is the difficult thing to do, because the members of the committee are liable to be widely scattered, but the papers offered for publication might be distributed among the members of the committee, assigning to each such subjects as he is best informed upon, and in this way gain better results than can be secured by the act of one man.

President Fell: This matter seems to demand changes in our constitution and by-laws. It would be very desirable for the committee on this subject, from whom we are expecting a report, to consult with Professor Kellicott and to embody in the new constitution these improvements suggested by one who is certainly better qualified, by his long experience and study of the subject, to make them than any one else among our number.

After some explanations concerning the failure of the Committee on Constitution to report at this meeting, upon motion of Governor Cox, Professor Kellicott was asked to formulate the suggestions made by him into by-laws, which could be adopted at this meeting and which could then be included in the general report on constitution next year.

On motion, the Committee on Constitution was given further time and to report at the next meeting.

After free nominations, the following-named persons were elected members of the Committee on Nomination of Officers for ensuing year: D. S. Kellicott, W. P. Manton, D. L. McIntosh, C. G. Milner, W. H. Seaman, G. S. Woolman, and C. C. Mellor. Subsequently S. H. Gage was selected to take the place of W. H. Seaman, who withdrew from the committee.

At eleven o'clock a recess was taken to witness some lantern exhibits by Dr. McIntosh in an adjoining room. The projections upon the screen were magnificently shown and included, among others, blood taken from the leg and forehead of Kemmler, executed by electricity. While that from the leg showed little or no difference from the normal appearance, that from the brow was manifestly and considerably altered, presumably by the electric current. An injected tooth of a dog showed a remarkable development of blood vessels and was a beautiful as well as instructive object. A very good photograph of a man was shown, taken with the crystalline lens from the eye of a calf.

Returning to the assembly room, Governor J. D. Cox gave, in an oral way, with illustrations on the blackboard, the substance of his papers on abnormal forms in diatoms, and a review of some of the generic and specific distinctions in the family Coscinodisceæ.

W. W. Rowlee: Is it possible to observe whether or not these divergent forms are absolutely connected in lines of descent from parent to offspring.

Governor Cox: Only to a very limited extent. We are obliged, at least in case of the free species, to draw our conclusions from the general association of the individuals, and such facts as can be made out in different ways. However, in the fasciculated forms better evidence can, of course, be obtained.

Professor Gage remarked that it was exceedingly refreshing to hear this discussion upon the change in form and characteristics within the limits of true specific distinctions, for much the same thing had been observed in regard to animals. He referred to a salamander, which had previously been described as two species, the one living upon the land the other in the water. The first had ciliated epithelium, the other stratified epithelium in its mouth; but instead of marking a distinction in kind, the change of color, structure, &c., was in some way correlated with the environment. He warmly commended the papers presented.

Professor Kellicott followed in similar vein, referring especially to infusoria. Had himself perpetrated species in a few instances upon insufficient knowledge of the possible variations within specific lines. Infusoria vary comparatively little in size, yet immense individuals may come from a cyst after conjugation.

Governor Cox: Among the diatoms the new, large individuals, the product of a conjugated pair, are the typical forms. As, after many generations, they become perceptibly smaller, they also become irregular and abnormal.

Professor Claypole: The subject as presented has been exceedingly interesting. Had long thought that a good deal of reduction ought to be made of the published species of diatoms, but had not anticipated that 10,000 such descriptions would or could be condensed to 1,000. Should like to inquire if it is possible to trace any recognizable variation according to geographical or geological distribution. At least among fresh-water species it would appear that a fine opportunity to study such changes might be found in the diatoms.

Governor Cox: As a partial answer it may be stated that in the fossil beds of these organisms there are very often noticeable characteristics and pecularities well marked for each bed. There is at least one difference, whether or not we consider these divergent forms distinct species or simply as varieties. It is much easier for beginners and students to gain a general knowledge of the group if the latter idea prevails. The introduction to the study of diatoms would be much simplified by admitting considerable variation within the specific limits.

Adjourned.

T. J. BURRILL, *Secretary.*

AFTERNOON SESSION.

At 2 o'clock the members assembled to take part in or witness the operations of the " working session." Strenuous endeavors had been made by the President and by Dr. Manton, of Detroit, to get the work of this session well organized before the assembly of the convention, but the result proved unsatisfactory, and it was left until members arrived in the city to complete the arrangements. In this Dr. Manton took charge and with some efficient assistance succeeded in making an excellent program, which was energetically carried out by the participants and enjoyed by the spectators.

Following is a complete list of the tables and operators, together with the class of work done by each:

Table No. 1—E. H. Griffith, A. M., F. R. M. S., Fairport, N. Y., miscellaneous work.

Table No. 2—Prof. Heneage Gibbes, University of Michigan, Ann Arbor, hyaline-fibroid degeneration, flagella on Spirillum.

Table No. 3—Prof. Simon H. Gage, B. S., Cornell University, Ithaca, N. Y., Winkel's marking apparatus for locating minute objects in a preparation.

Table No. 4—M. D. Ewell, M. D., LL. D., Chicago, Ill., micrometers and micrometry.

Table No. 5—Mary A. Spink, M. D., Indianapolis, Ind., sectioning and mounting.

Tables Nos. 6 and 7—W. W. Rowlee, Cornell University, Ithaca, N. Y., sectioning mature seeds.

Table No. 8—M. B. Thomas, Cornell University, Ithaca, N. Y., the sectioning of large pistils.

Table No. 9—L. D. McIntosh, Chicago, Ill., attachment for using a solar and oxy-hydrogen microscope, with direct or central and oblique illumination and illuminating and projecting opaque objects.

Table No. 10—F. L. James, Ph. D., M. D., St. Louis, Mo., mounting in glycerine, sharpening microtome knives.

Table No. 11—R. N. Reynolds, M. D., Detroit, Mich., (*a*) sectioning injected material; (*b*) mounting diatoms.

Table No. 12—Prof. Henry L. Tolman, Chicago, Ill., methods of preparing slides of blood.

Table No. 13—G. S. Woolman, Esq., New York, N. Y., homogeneous immersion object glass, direct and oblique illumination.

Table No. 14—J. A. Close, M. D., Summerfield, Ill., (*a*) injecting tree-frog with special apparatus; (*b*) dissecting with Stephenson's binocular; (*c*) living trichinæ in muscle of white rat; (*d*) White's improved life slide; (*e*) Close's tadpole slide; (*f*) Close's frog plate; (*g*) Close's balsam bottle.

At 4 o'clock a call was made for attendance in the assembly-room to listen to the reading of papers as follows:

Stuart H. Perry: Freshwater Rhizopods of Oakland County, Michigan.

Dr. M. D. Ewell: Two New Forms of Stage Micrometer. (See p 76.)

Accompanying this paper the Doctor showed a glass plate for photogravure work, 8 by 10 inches in area, ruled with parallel lines 100 to the inch, covering the entire surface and without a defect in the ruling of the whole surface—a triumph of skill and perfected method.

Dr. W. H. Seaman presented a drawing with descriptions of a new form of microscope.

Dr. Mary A. Spink read a paper upon a Microscopical Study of the Choroid Plexus.

The President: Dr. Spink is the first lady to read a paper before our Society upon a histological subject and I am sure we all congratulate her upon the success attendant upon her studies and the presentation of the results.

Mason B. Thomas then read a paper upon the Celloidin Method in Botany.

Professor Gage simply remarked that any one who has seen slides prepared by Mr. Thomas in the manner described needed no further evidence of the value of his methods.

Mr. Tolman: I had believed that dehydrating and hardening soft vegetable tissues could not be successfully accomplished, but the ocular demonstration is absolutely convincing. The process shall be given a trial at my house.

A paper on the Preparation and imbedding the Embryo of Chick, by Messrs. S. H. Gage and G. S. Hopkins, was read by the latter.

Professor Gage: Mr. Hopkins did all the work described in this paper except devising the glass tacks and their arrangement for use. Taking the set of these in his hand, the speaker detailed the advantages of this method of holding the prepared corks under the hardening liquid and made plain the improvement over the older ways.

After this the meeting adjourned.

T. J. BURRILL, *Secretary.*

THURSDAY EVENING, *August 14, 1890.*

This evening was devoted to the exhibition of microscopic objects at Princess Rink, a very large inclosure excellently adapted for the purpose. Under the direction of Dr. R. N. Reynolds, of Detroit, arrangements had been made for a magnificent display and for the accommodation of a great throng of spectators. There were 177 numbers printed in the catalogue of microscopes and objects, and this number was somewhat more than equaled upon the tables. Notwithstanding the elaborate preparations made for a great concourse of invited guests, many of the latter could not make the rounds of the instruments. Those who did get a chance to look lingered too long over the wonders of the world of little things, and the movement of the long files was too slow for the crowd of eager unfortunates outside of the envied succession. As is universally the case, the low-power exhibits were most attractive, and anything living disproportionally detained the observers. To the many who beheld the microscopic wonders for the first time the evening will be long remembered and the Society will gain by the pleasure thus afforded.

FRIDAY, *August 15, 1890.*

The Society convened at 10 o'clock, President Fell in the chair. The following-named persons, upon recommendation of the Executive Committee, were elected members: G. Carl Huber, M. D., Ann Arbor, Mich.; Wm. Gaylord, Sandusky, Ohio; John Kapp,

M. D., Ann Arbor, Mich.; Fred. H. Seymour, Detroit, Mich.; E. T. Hartley, Lincoln, Neb.; Isaac Douglas, M. D., D. D. S., Romeo, Mich.; F. Wilmot Brown, M. D., Detroit, Mich.; Wm. C. West, M. D., Monroe, Mich.

The first paper upon the program was on Fees of Experts with the Microscope, by C. M. Vorce, in his absence read by Dr. F. L. James.

The reading of this paper elicited much discussion among the members of the Society, both in and out of the meeting. No one could question the propriety of this discussion nor its importance to members of the Society, and as the paper does not appear in full the following brief abstract by the Secretary is here inserted. The author argues that all persons who become skilled in the use of the microscope are liable to be called upon because of such skill to make examinations and report conclusions as an expert. This should and does operate as an incentive to increased care and skill in microscopical work and therefore encourages microscopical research in full accord with the purposes of the Society.

For convenience of discussion let us divide the subject into sub-heads as follows:

"1. Should fees be charged for mere matters of opinion by one who does not follow the occupation of microscopical examination as a business or profession?

"2. By what rule should the fees to be charged by the expert in making examinations with the microscope and reporting thereon be estimated?

"3. What is the proper attitude of the expert in the matter of fees and in the character of witness, and what, if any, rule of ethics should govern him in the matter of making examinations and returning opinions?"

1. After noting the assumption that for one possessing scientific knowledge it tends to degrade or belittle his acquirements by accepting pay for his opinion, and that if paid he will be inclined to make such opinion favorable to the employer, the author replies that the giving of gratuitous opinions leads inevitably to hasty and less trustworthy results. The "curbstone opinions" of lawyers are cited as an example, and the conclusion is reached that an opinion of the scientific expert "should be formed only after careful study of the specific subject of inquiry, and in the light of past experience and previous knowledge in the same line, and the time spent in so doing should be as justly paid for as if spent in any other employment."

2. It is a vicious principle to be goverend in regard to the amount of the fee by the amount at stake or in proportion to the ability of the client to pay, The true basis of all compensation for services is upon the amount of time and labor necessarily spent by the employé. The rate of compensation varies, very properly, according to the experience, ability, etc., brought to the task; but the basis of compensation remains the same. All fees of experts should be, and largely are, based upon a per diem estimate, and this should be the rule in microscopical work.

3. Professional ethics requires of every one that he should not disclose any matters communicated to him in a confidential capacity, or which came to his knowledge by reason of his employment in any such manner. The expert may examine the same object for any number of people, but he must not intimate to any one the opinion given to another, or even the fact that he had done so. The expert witness is bound by his oath to state the truth and the whole truth just as much as any other witness, and if he states less than the whole truth by suppressing facts which militate against his opinion he escapes perjury by an exceedingly close margin indeed. He has earned his fee when the work is completed, no matter whether his opinion is good or ill for the employer, and all that can be asked of him is to state the honest results obtained.

From the experience of nearly a quarter of a century the author says the fee should invariably be paid in advance, and that for further service either a per diem charge or a gross sum should be stipulated. "Above all things, the expert should avoid enlisting as a partisan on the side of his employer, but should give his opinion regardless of who is hurt or helped by it, which, if he has been paid for his time, he can do without any anxiety."

Dr. James: I will say that my practice is in accordance with the suggestions of this paper. A fee is charged for service rendered based upon a per diem rate of twenty-five dollars.

Dr. Ewell: Your amount is too small. Should at least make it fifty dollars, and one hundred would be better appreciated. I would rather have one than two cases for the same money, and a high estimate of one's services will never be amiss. Would emphasize the pay-in-advance principle, and do not accept engagement by prosecuting attorney unless you know that he has the authority of the board of supervisors. Especially, however, if you are engaged on the defense, the payment in advance is good advice, as I have considerable reason to know.

Dr. James: After sitting back in his office some time with nothing to do, perhaps it may be considered worth while for one who desires employment to put his fee at some such sum as can be paid.

Dr. Ewell: Of course, I am speaking of those like the Doctor himself, who have passed their apprenticeship and have become recognized authorities in their specialties.

President Fell asked Vice-President Seaman to take the chair and spoke upon the subject as follows:

The grounds that the amount of interest involved should not have a bearing upon the fee does not appear to be followed by the legal profession if the many reports of enormous legal fees are to be relied upon, and in many cases it appears unjust that in expert work where a few hundred dollars are at stake there should be allowed as great a fee as when many thousands are involved. Then again, special arrangements to the effect that if the expert should succeed in obtaining certain results he would be well rewarded might prove a stimulus to renewed exertion. This presupposes that all experts are honest. Of course if the result of their labor would not stand the scrutiny of their legal opponents, it would not be of great value. The Doctor related a case somewhat in question as follows: Certain parties employed him to examine into a case which was admitted by their attorneys and themselves to be desperate. They agreed to pay the Doctor a handsome fee if he succeeded in establishing a favorable aspect to their case. He did so. The lawyers took advantage of his work; made contracts with their clients by which they obtained an enormous fee, considerably over ten thousand dollars, and they considered that the expert's fee should be nominal. Their opposing attorney stated that if the expert had refused to give his knowledge in the case the clients would have willingly paid a very much larger sum than he obtained after divulging it.

What he contended for was that circumstance should modify the fee of the expert as well as the fee of the members of the legal profession.

Dr. Ewell: Any conditional agreement based upon the results of a decision or verdict is contrary to public policy and void. A case was cited in which such contingent additional fee was agreed upon in the event of the success of the employer's side and though accruing according to stipulation was not paid and was brought to trial. The court decided the payment not legally authorized, because such stipulations tended to bias testimony and were contrary to good policy. The fee should be made large enough to begin with and then abide by the bargain.

Dr. Mercer related the story of a prominent attorney in his town with whom another prominent citizen and acquaintance chatted upon legal matters while walking together upon the street. Prominent citizen afterward carried a case to the courts and lost, then asked attorney how it happened that his opinion so radically differed from that of the court. In reply, the query was propounded as to the amount paid for said opinion. Also another, of a man from a neighboring village who went into a physician's office to consult about treatment and asked about cost of same. Physician, supposing the man to be poor and unaccustomed to large bills, named ten dollars. Poor man sought another physician, and for same thing had named one hundred dollars as fee; accepted latter, saying there were plenty of ten-dollar doctors in his own village. The inferences here are sufficiently plain.

Professor Tolman expressed himself as much pleased with the suggestions of the paper, remarking that he had charged up a considerable number of accounts to experience, and was, he hoped, the wiser in consequence; did not think a contingent fee wise or proper. Its tendency was bad. The best way is to make an original fee large enough for the proposed service and then agree upon a per diem allowance for further work; had not demanded pre-payment, but should have had less to charge to experience in that way.

There is the question of, who is an expert?

One answer is that an amateur does not, and an expert does, charge for his services. This certainly is not a good definition; but at best the distinction seems to be left with the man himself to make. The trouble with expert testimony is that the law makes no distinction in this respect. We ought in some way to have the term expert properly defined, and then an improvement might be made in this matter in the courts. Assuming now that an expert is one who makes it his business to professionally examine and to report upon matters in dispute within his province, is one who, after such examination, has given an unfavorable report, open to engagement on the other side? The case is different with a lawyer. The law does not require him to divulge secrets obtained in a professional way, but a witness is sworn to tell what he knows and all he knows. A lawyer may also engage upon the wrong side and, if he wins, public opinion supports him in his professional endeavors. The two are different also in this respect: No mercy is shown an expert witness if the decision seems to be against him. Upon the whole, it would seem proper that an expert may properly engage upon the opposite side after having rendered an adverse report, but that he ought not to be required to divulge any information obtained by reason of his first employment.

Dr. Detmers: Is an expert on the witness stand obliged to answer all questions put to him? Is he obliged to tell everything he happens to know upon a given subject?

Dr. Ewell: The law makes no difference between witnesses, whether experts or not; but no one is obliged to do any work, to seek out information, against his will.

At this point Dr. Manton asked leave to call attention to Grace Hospital, which was left out from the published list of public institutions worthy of a visit by members of the Society.

The Treasurer's report being called for was presented by C. C. Mellor, and also report on Spencer-Tolies fund.

The report of the committee on nomination of officers reported as follows:

NOMINATIONS FOR 1891.

President	Dr. F. L. James, St. Louis, Mo.
Vice-Presidents	Prof. E. W. Claypole, Akron, Ohio.
	Prof. M. D. Ewell, Chicago, Ill.
Secretary	Dr. W. H. Seaman, Washington, D. C.
Treasurer	C. C. Mellor, Pittsburgh, Pa.
Elected Members of Executive Committee	Dr. E. L. Shurley, Detroit, Mich.
	Dr. J. O. Stillson, Indianapolis, Ind.
	Dr. A. Clifford Mercer, Syracuse, N.Y.

C. C. Mellor: Mr. President, I wish to explain that the person who appeared to be the choice of the majority of committee for the office of Treasurer stated that he felt constrained to decline the nomination; not that he did not appreciate the honor and feel highly complimented by the confidence in him implied by the offer of the office, but simply because his many business engagements so fully occupied his time that it was difficult to attend properly to the duties of the Treasurer.

Another difficulty in the way was that the gentleman proposed was a member of the Nomination Committee, and it was very questionable propriety for him to be nominated by a committee of which he was a member; but there are precedents for this in the history of the Society. However, the long and the short of it was that the gentleman found himself in the hands of six bold and bad men—a sort of six-armed octopus—and there seemed to be no escape from their grrsp. The gentleman, like Davy Crockett's coon, came gracefully down the tree.

He insisted, however, that the duties of Custodian must be separated from that of the Treasurer, as has already been proposed.

On motion, the Secretary was instructed to cast the ballot of the Society for the persons named for the respective offices. This being done, they were declared duly elected.

Dr. Mercer moved that the President be authorized to appoint delegates to a celebration at Antwerp of the invention of the microscope. (See note, page 246.)

A paper upon the Identification of hair, by Dr. Ewell, was read by title and referred to Committee on Publication, and the same disposition was made of one by Dr. Howard N. Lyon on "A cover-glass support for mounts in solid media."

A discussion now took place upon the advisability of meeting at the same time and place the American Association for the Advancement of Science, opened by Dr. W. H. Seaman, who, in brief, said:

The members of this Society consist of two classes, viz., those who are amateurs or those who use the microscope for the love of it, and those who use it in their professional occupation. This Society was founded by the first class, but is increasingly attended by those belonging to the second class. In 1879, of 104 members eight were members of the A_3S, and last year, of 340 members 33 are members of the latter association. Perhaps it is true that the members of this second class are now doing the most work. Miss Booth, of Long Meadow, Mass., suggests that the time elapsing between the two meetings be shortened, and I am inclined to think it would be desirable for us to meet at or near the same place with this large association and upon Thursday instead of Tuesday of the week preceding, permitting our session to extend so as to include Monday instead of Friday, as at present.

Professor Gage: I am also a member of the A_3S, and usually attend the meetings, but I do not think it would at all answer for us to meet at the same time and place with that association. We should simply be a tail to it and nothing else.

Dr. Detmers: Yes, sir; and a microscopic tail at that. We should keep ourselves entirely independent; pay no attention to others and suit ourselves. It seems impossible to get railroad reductions available for both meetings when held near together, since tickets can be bought only three days before the first meeting and good only three days afterward. I can now return from Detroit to Columbus at one-third rate, and may in the same way return from Indianapolis, if I choose to attend, at same reduction.

The President: May it not be as well to meet near the American Medical Association?

Dr. James: That association has a large membership and the hotels are crowded. It is not wise to attempt to meet at same place and time with these larger societies, but if we can meet near the Association for Advancement of Science it would accommodate several of our members.

Dr. Seaman: It might be better to meet near the A_3S, and upon Wednesday rather than Tuesday.

Dr. Ewell: We ought to have more time. Our sessions are not long enough; should have more time for discussion; ought to have two more days.

Dr. Mercer: In our discussions we wander away from the topic. What we want is closer attention to the matter before us, and less time would suffice.

The President: We have been getting along in good order, finishing our program for each session and having good discussions also.

Professor Claypole: It will be a great convenience for many of us to meet near the Association for the Advancement of Science.

This appeared to be the opinion of the majority, but upon vote the time and place of meeting was left to the Executive Committee.

It was moved and carried that the Treasurer be authorized to appoint an assistant, to act as Custodian.

The Committee on the Uniformity of Tube Lengths presented the report found on page 247.

Dr. Mercer: We owe a great deal to the original mover in this matter, and now should like to secure still further services of same kind. I move that Professor Gage be appointed a committee to correspond with the opticians of the world upon the subject and to report progress at our next meeting.

Motion prevailed.

Dr. Detmers: Mr. President, there is another thing to which I wish to call attention. We now know that Zeiss uses fluorspar in the construction of his apochromatic objectives. Yesterday I happened to be in Cleveland, Ohio, and called upon Herbert R. Spencer. When this matter of the use of fluorspar in objectives was mentioned he showed me, in the handwriting of his father, Charles A. Spencer, several formulæ for objectives with lenses of this substance. Here, then, we have another instance of American invention of which the credit has gone to the other side of the ocean. The full facts in this connection can be ascertained, and I move that the Secretary be instructed to correspond with Mr. H. R. Spencer and to publish the results in connection with the proceedings of this meeting.

Carried.

Dr. Deck: Did Spencer actually construct objectives containing fluorspar?

Dr. Detmers: Yes, sir; I have seen the records in the regular books kept at the time for the purpose of entering the objectives under their regular order of manufacture.

The next paper was by Mrs. S. P. Gage on the "Form and endings of striated muscular fibers," read by Professor Gage.

This was followed by the "Comparative structure of the external and middle ear of the cat," by Thomas B. Spence; also read by Professor Gage.

The latter remarked that this last was a thesis presented and accepted for a bachelor's degree in Cornell University, and he had urged that it be brought here because of its excellence. It was one of the best pieces of work of the kind that had ever come to his knowledge, and he should be glad to have others see it.

Dr. Mercer: Perhaps it is not the thing to formally propose a vote of thanks to Professor Gage and to Cornell University, but I do want to express the high appreciation we all have of the excellent work done at that great institution and contributed to the program of this meeting, especially in the department of which Professor Gage is the head.

Dr. Detmers moved that the Committee on a Proposed Journal for the Society be discharged.

Motion prevailed.

The proposed changes in the Constitution and By-Laws in regard to the publication of proceedings, custodian, and associate members were read and referred to the Committee on New Constitution.

The President appointed a Committee on Final Resolutions, as follows: W. H. Seaman, H. L. Tolman, D. L. McIntosh, E. W. Claypole, and C. C. Mellor.

Adjourned to meet on the boat Fortune, on Detroit river, at 2 o'clock.

T. J. BURRILL, *Secretary.*

Afternoon Session and Excursion.

At 2 o'clock the members and some invited friends assembled on board the steamer Fortune and enjoyed a magnificent trip on one of the finest waters in America, while at the same time the hours passed pleasantly in social intercourse and in further making acquaintance one with another. Upon the special invitation of Parke, Davis & Co. * the entire body landed at their wharf and were shown through their immense laboratories, while the various processes in the manufacture and preparation of drugs and medicines were in active operation. No description of this great business can here be given, but the members of the Society expressed by words and acts their intense interest in what they saw and their obligation to the proprietors and employés for the attentions shown them. Returning to the boat, they were further delighted by the appearance of these same employés in a new rôle, viz., attendants in serving a most enjoyable and heartily appreciated collation, which microscopists have never been known to refuse despite the revelations of high-power objectives.

Finally President Fell again called the Society to order, and, after some remarks upon the success attendant upon the Detroit meeting and the pleasure of the occasion, called for the report of the Committee on Final Resolutions. Instead of the formal statements usually presented in writing the report, took rather the shape of toasts and responses, the latter by various persons called upon for the purpose. This was a most agreeable departure from ordinary

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* Wednesday, *June 4, 1890.*

Prof. T. J. Burrill, *Champaign, Illinois.*

Dear Sir: Learning that the annual meeting of the American Society of Microscopists will be held in this city about August 12th, and thinking perhaps that while here an inspection of our laboratory might be of interest, it affords us pleasure to invite you to visit it for that purpose. We cordially extend to you this invitation at the kind suggeston of Mr. Henry W. Fuller, of New York, a member of your body.

As chemists and pharmacists, we have long since learned the great value of the microscope and we fully recognize the benefits that we derive from the researches of the microscopist himself. Feeling thus an obligation, we would like in some measure to reciprocate it by affording you such interesting information as a visit to our laboratory may impart. We can at least assure you of a hearty welcome, and at the same time we shall endeavor to make you feel that your time has not been illspent should you honor us with your presence.

Hoping to have the pleasure of your acceptance, we are,

Very truly your friends,

Parke, Davis & Co.

usage, and gave an opportunity to the gifted ones to display their wit and ready repartee. In this way thanks were offered to the local committee and citizens of Detroit, responded to by Dr. E. L. Shurley, of Detroit; to the daily press of Detroit, responded to by Edward Bausch, of Rochester, N. Y.; to the railroad traffic associations, responded to by Dr. R. N. Reynolds, and to Parke, Davis & Co., responded to by Mr. W. Anderson, of that firm.

After a vote of thanks to the retiring President and Secretary for their labors in behalf of the meeting, the former said there must come an end to all things except holding office by himself, for he had attended the first meeting of the Society and had been in office ever since. Now, as past President, he should be a member of the Executive Committee. We all desire in this world to have a good time, but really only those succeed who have hard work to do and accomplish it with willing and resolute hands; hoped that officers and members would all work faithfully for the good of the Society, not waiting one for another, but each making himself foremost in every good way. Now you have elected a better man than myself as president, and all that is left for me to do is to resign my place to him.

President-elect Dr. F. L. James, of St. Louis, then stepped forward and accepted the honor thus conferred upon him, though he feared the Society had made a mistake in electing a man who could not conduct its affairs to the high degree of success heretofore attained. He was well aware of the labor required on the part of the chief officers of the Society and entered upon the duties of President with his eyes open upon that point, yet would promise to do the best possible under the circumstances, and would strive to be faithful in the discharge of the duties devolving upon him.

There being a few moments to spare before reaching the wharf, Dr. Seaman spoke to "the good of the order," after which the Society adjourned to the time and place to be selected by Executive Committee in 1891.

T. J. BURRILL, *Secretary.*

NOTE.—The 300th Jubilee anniversary of the discovery of the microscope. See Journal Royal Microscopical Society, August, 1890, p. 522.

W. H. S.

Discussion on Photomicrography as Corrected by Dr. Mercer.

Dr. Mercer could not agree with Governor Cox in holding that an eye-piece should always be used with the objective to get the best results in photomicrography. He called attention to the fact that in the ordinary use of the microscope a virtual image is seen ; and, further, that the whole instrument is corrected to make that virtual image as perfect as possible for rays of light taking mathematically defined paths through the various lenses. In photomicrography with the whole instrument, not a virtual but a real image is formed by rays taking not the same but quite different paths through both the objective and eye-piece. Now, for example, the rays incident on the eye-lens come from an aerial object beyond its principal focus, while in the first instance rays are from an aerial object within the principal focus of that lens. The eye-lens is not achromatic, but in the first instance its aberrations are corrected by its relative position. In the second instance the radical change in the paths of the rays allows both chromatic and spherical aberrations to vitiate still farther the already faulty image formed by the objective working at the disadvantage of a change in position (at a greater distance from the object than that for which has been so nicely corrected). To get the best results in photomicrography the objective should be left in its ascertained best position and collar correction and the "ten-inch" back focus extended to the required distance by means of a specially corrected concave lens (the Woodward method) or the ordinary eye-piece should be replaced by a specially corrected projecting eye-piece (the Abbe method). The Huyghenian eye-piece is corrected for a radically different purpose and is, therefore, at least theoretically, quite out of place as a projecting lens.

BUFFALO, N. Y., *Jan. 27th, 1891.*

Prof. T. J. BURRILL.

My Dear Sir: Your favor* of 21st inst. came to hand this morning. Since coming to Buffalo my time has been so fully occupied that I had, for a long time, forgotten entirely the subject mentioned in your letter. As the time is so limited, and having no knowledge of how much space you had intended to give to the subject in the forthcoming publication of the proceedings of the A. S. M., I have thought best to state to you, as briefly as possible, the facts, leaving it to you to arrange them in proper form for publication, with whatever comments you see fit to make.

During the summer of 1860 Dr. Rufus King Brown, who was, at that time, a resident of Brooklyn, N. Y., visited my father at Canastota, and during his stay there my father made for him a 1-8 objective, which was considered by all who saw it to be the best ever made up to that date. Although but a young boy at the time, I was greatly interested in my father's work, and knew pretty well what was going on—hearing a great deal of talk, and remember well Dr. Brown's high praise of the performance of the objective; but of course knew nothing of its construction until some years later. Some years later, after Mr. Tolles had removed his establishment to Boston, Dr. Brown became a resident of that city, and showed the objective to Tolles, who praised its performance very highly.

The angular aperture of the objective was 175°. One of the systems contained fluorspar, and it is on record in the formula that it was remarkably perfect in its corrections for both figure and color, with both oblique and central illumination. In the years 1864 and 1865 I made lenses for quite a number of objectives, mostly 1-4 in., containing at least one lens of fluorspar, and having apertures from 170° to 176°; but of course with very short working focus. In all these objectives, as well as in the one made for Dr. Brown, the spar lenses were cemented between others, as owing to its softness and liability to become scratched it was not considered safe to leave it in an exposed position. About the time that immersion lenses came into general favor in this country the use of the spar was abandoned, owing to the difficulty experienced in procuring that which was free from fractures or seams. When used in the 1-4 I dreaded making them more than all others in the objectives, often having to throw them away, owing to their having such defects. Shortly after our removal from Canastota to Geneva I made a 1-12 water im., containing one spar lens; but that is the only one since I was a boy. When Dr. H. J. Detmers, of Columbus, O., visited me at Cleveland (about the time of the meeting of the A. S. M. at Detroit) I showed to him the old book containing the records of all these objectives as kept by my father, and among them the 1–S, marked R. K. B., also 1–8, containing a spar lens ; which was made as far back as 1851, about the time my father begun making objectives of large angle, showing how early in the fight he appreciated the valuable optical qualities of fluorspar in the construction of objectives. The angular aperture of this 1–8 was not given, but I can readily see that it could not have been less than 160°.

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*This letter was received by me Jan. 31, 1891, after the preceding pages were in press. Professor Burrill informed me by accompanying letter that he had sent a request to Mr. Spencer for information as to the facts about fluorspar objectives.

W. H. S.

These are, I think, all the facts necessary, but I may have made too much of it. It has been hurriedly written off and is not in proper shape for publication, but you can cull out the facts and arrange them properly for publication in the forthcoming proceedings. I shall esteem it a great favor if you will do so, as I look upon the facts as of value in connection with the history of the microscope.

I trust you will pardon the use of the pencil, for I have been anxions to send this by the first mail. Please let me know if it reaches you in time.

Very truly yours,

H. R. Spencer.

REPORT OF THE COMMITTEE OF THE AMERICAN SOCIETY OF MICROSCOPISTS ON UNIFORMITY OF TUBE-LENGTH.

Believing in the desirability of a uniform tube-length for microscopes, we unanimously recommend :

1. That the parts of the microscope included in the tube-length should be the same by all opticians, and that the parts included should be those between the upper end of the tube where the ocular is inserted and the lower end of the tube where the objective is inserted.

2. That the actual extent of tube-length as defined in section 1—Be, for the short or continental tube, 160 mm., or 6.3 inches, and 8½ inches, or 216 mm., for the long tube, and that the draw-tube of the microscope possess two special marks indicating these standard lengths.

3. That oculars be made par-focal, and that the par-focal plane be coincident with that of the upper end of the tube.

4. That the mounting of all objectives of ¼ inch and shorter focus should be such as to bring the optical center of the objective 1½ inches below the shoulder, and that all objectives be marked with the tube-length for which they are corrected.

5. That non-adjustable objectives be corrected for cover glass from $\frac{15}{100}$ to $\frac{20}{100}$ mm. ($\frac{1}{170}$ to $\frac{1}{130}$ inch) in thickness.

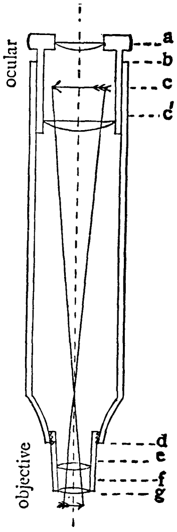
These recommendations give a distance of 10 inches (254 mm.) between the par-focal plane of the ocular and the optical center of the objective for the long tube, and are essentially in accord with the actual practice of opticians.

At the request of the committee, a joint conference was held with the opticians belonging to the Society and present at the meeting. They expressed their belief in the entire practicability of the above recommendations and a willingness to adopt them.

(Signed) SIMON H. GAGE.
A. CLIFFORD MERCER.
CHARLES E. BARR..

Tables and Cut Reproduced From the Proceedings (1887, pp. 168-172) to Illustrate the Lack of Uniform Standards of Tube-Length and Thickness of Cover Glass for Which Non-Adjustable Objectives are Corrected, and Hence the Desirability of Some Action Like the Above Recommendations Looking Toward Uniformity.

Length in Millimeters and Parts Included in "Tube-Length" by Various Opticians.



Pts. included in "Tube-length." See Diagram.		"Tube-length" in Millimeters.
a-d	Grunow, New York	203 mm.
	Nachet et Fils, Paris	146 or 200 mm.
	Powell and Lealand, London	254 mm.
	C. Reichert, Vienna	160 to 180 mm.
	W. Wales, New York	254 mm.
b-d	Bausch & Lomb Opt. Co., Rochester	216 mm.
	Bézu, Hausser et Cie, Paris*	220 mm.
	Klönne und Müller, Berlin	160–180 or 254 mm.
	W. & H. Seibert, Wetzlar	190 mm.
	Swift & Son, London	165 to 228½ mm.
	C. Zeiss, Jena	160 or 250 mm.
a-g	Gundlach Optical Co., Rochester	254 mm.
a-g	R. Winkel Göttingen	220 mm.
c-d	Ross & Co., London	254 mm.
c-e	R. & J. Beck, London	254 mm.
c-g	H. R. Spencer & Co., Geneva, N. Y.	254 mm.
c-f	J. Green, Brooklyn†	254 mm.
c'-e	E. Leitz, Wetzlar	125–180 mm.
	For oil immersions	160 mm.

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* Successors to Hartnack.
† Successor to Tolles.

Thickness of Cover Glass for Which Non-adjustable Objectives are Corrected by Various Opticians.

$\frac{25}{100}$mm.	J. Green, Brooklyn. J. Grunow, New York. Powell and Lealand, London. H. R. Spencer & Co., Geneva, N. Y. W. Wales, New York.
$\frac{18}{100}$mm.	Klönne und Müller, Berlin.
$\frac{17}{100}$mm.	E. Leitz, Wetzlar (when tube 160–170 mm.).
$\frac{17}{100}$mm.	R. Winkel Göttingen, Germany.
$\frac{16-25}{100}$mm.	Ross & Co., London.
$\frac{16}{100}$mm.	Bausch & Lomb Optical Co., Rochester.
$\frac{15-20}{100}$mm.	C. Zeiss, Jena ($\frac{16}{100}$mm. for apochromatic oil immersions).
$\frac{15-18}{100}$mm.	C. Reichert, Vienna.
$\frac{15}{100}$mm.	Gundlach Optical Co., Rochester. W. & H. Siebert, Wetzlar. R. & J. Beck, London.
$\frac{12-17}{100}$mm.	J. Zentmayer, Philadelphia.
$\frac{10-12½}{100}$mm.	Nachet et Fils, Paris. Bézu, Hausser et Cie, Paris.
$\frac{10}{100}$mm.	Swift and Son, London.

REPORT OF CONDITION OF TOLLES-SPENCER FUND AUGUST 15, 1890.

Cost of one share of stock in the Perpetual Savings and Building Association of Urbana, Ohio, purchased by former Treasurer, D. S. Mosgrove	$200 25
Cash on hand	53 61
Total paid subscriptions and accrued interest	$253 86

(Signed) C. C. Mellor, *Treasurer.*

REPORT OF TREASURER C. C. MELLOR.

Receipts.

Cash in hand August, 1889	$26 62
Received dues for 1887	4 00
" " " 1888	8 00
" " " 1889	40 00
" " " 1890	497 00
" " " 1891	18 00
Received admission fees 1890	60 00
" " " 1891	9 00
Advertisements in Proceedings, 1889	49 00
Sale of Proceedings	66 86
Total income	$778 48

Expenditures.

For printing, binding, and mailing Proceedings	$481 22
Postage, freight, and other expenses	118 42
Cash on hand	178 84
	$778 48

We, the subscribers, hereby certify we have examined the foregoing account of C. C. Mellor, Treasurer, for the year from August 20, 1889, to August 11, 1890, and have found the same correct, with proper vouchers for the various expenditures.

Signed by— Wm. H. Seaman.
F. W. Kuhne.

Detroit, *August* 12, 1890.

ERRATA.

Page 96, lines 1 and 4, for "Englypha," read Euglypha.

Page 124, line 3 from bottom, for "Whitall and Tatam," read Whitall and Tatum.

Page 165, foot-note, for "Aganoid," read A. ganoid.

Page 243, line 29, for "page 247," read page 250.